

UNITED STATES GOVERNMENT  
MEMORANDUM

U.S. FISH AND WILDLIFE SERVICE

NEW ENGLAND FIELD OFFICE  
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APR 17 2001

To: Jeanne Voorhees, Connecticut Unit,  
Environmental Protection Agency, Region I April 10, 2001

From: *Vernon Lang*  
Vernon Lang,  
New England Field Office,  
U.S. Fish and Wildlife Service

Subject: Connecticut Water Quality Standards, Revisions to Marine Dissolved  
Oxygen Criteria

As requested by your March 20, 2001 Memorandum, I have reviewed the Statement of Reasons and the Addendum to the statement submitted by Connecticut Department of Environmental Protection in support of its proposal to lower dissolved oxygen criteria in subpycnocline offshore waters in Long Island Sound.

The proposed D.O. criteria in the Connecticut Water Quality Standards is not less than 3.5 mg/l for offshore waters within and below the seasonal pycnocline. Cumulative periods of D.O. exposure in the 3.5-4.8 mg/l range shall not exceed parameters detailed in Appendix E. The existing D.O. criteria would remain unchanged in near shore waters, in waters above the seasonal pycnocline and throughout the Sound when no pycnocline is established. Connecticut's proposal is based substantially on the Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen; Cape Cod to Cape Hatteras recently released by EPA as a final document.

In my May 30, 2000 comments on the draft proposal, I raised concerns about whether Connecticut's Water Quality Standards would allow for D.O. excursions below the 4.8 mg/l chronic effect level for significant periods of time as envisioned in Appendix E. As the ambient saltwater D.O. criteria document states, growth of aquatic life is generally the most sensitive life cycle function to low D.O. (P. 7). The criterion continuous concentration for growth is set at 4.8 mg/l using methods compatible with the criteria guidelines developed by EPA (Stephan et al). The 4.8 mg/l criterion is intended to represent the ceiling above which D.O. conditions should support both survival and growth of most species (P. 17 & 36). However, as footnote seven on page 11 states, the 4.8 mg/l criterion represents the potential for an approximate 25% reduction in growth. Indeed, the data in Table 2 and Appendix C reveal a number of individual tests in which the chronic values exceed the 4.8 mg/l criterion for growth. One of the most sensitive species studied, the lobster is an ecologically, recreationally and commercially important species

in LIS. It is also used as a surrogate to represent other sensitive species. Among the potential limitations in the D.O. criteria document is the limited number of species tested when compared to the total number of species in LIS waters (P. 41, F-2). Consequently, we do not know how many other species/life stages exist that may be more sensitive to low D.O. than the lobster or the other test species. Another unknown is the effect of other stressors in the environment on the sensitivity of species to low D.O. In a human dominated environment such as the LIS watershed, these stressors likely include toxins; other pollutants that elicit physiological, behavioral or other responses; temperature; changes in salinity; suspended solids; and others (P. 40).

A significant unknown with Connecticut's proposal is the cumulative impact on sensitive species/life stages of aquatic life due to growth impairment when excursions are allowed in the 3.5-4.8 mg/l range as provided by Appendix E, in addition to the 25% growth impairment allowed by the CCC (4.8 mg/l). The data on Table 12 and in Appendix C and I show that lobster experience a 60% growth reduction and the longnose spider crab experience a 50% reduction in growth when D.O. is at 3.5 mg/l. When D.O. is at 5 mg/l, the spider crab experiences a 25% growth impairment and the lobster experiences a 20% growth impairment (Figure I-11). If other species/life stages in LIS are more sensitive than lobster or longnose spider crab, then the effects would be correspondingly more severe.

As indicated in my 5/30/00 comments, the language in surface water standards 12 and 13 and parameter 12 in both SA and SB criteria would seemingly be compromised by the proposed D.O. criteria for subpycnocline waters. Whether biological integrity can be achieved and maintained as required by standards 12 and 13 is open to question. Connecticut appears to claim the baseline condition in LIS as one in which natural hypoxia occurred prior to colonization (Statement of Reason P.12). However, the Long Island Sound TMDL contradicts this assertion on pages 21 and 22 and on Table 5. Here, the lowest hourly minimum D.O. in Connecticut waters is 5.6 mg/l and in New York waters the value is 5.3 mg/l. Consequently, the baseline for biological integrity from the standpoint of D.O. in LIS is for a community of aquatic life unimpaired by dissolved oxygen hypoxia at any time or place. It is not clear that the existing 5 mg/l D.O. standard for class SB waters completely satisfies the biological integrity standard given the growth impairment demonstrated in Appendices C and I of the criteria document. Another factor to consider is whether the proposal to allow excursions in D.O. down to 3.5 mg/l would prevent harm or harmful conditions from occurring as prohibited by parameter 12 in both SA and SB waters. In addition to growth impairment discussed above, the larval mortality curve allows for a 5% loss in recruitment on a seasonal basis. However, this seasonal basis has a long time step or averaging period. When viewed on a daily or cohort by cohort basis, the mortality rates could be 25% or greater when D.O. is in the 3.5 mg/l range (P.27). Clearly, this level of mortality cannot be said to be nonharmful to those species/life stages suffering the consequences. In addition, if the critical life stage is compressed into a short time span, e.g., a pulse effect involving a few days when the D.O. is in the 3.5 mg/l range, then year class or population effects could occur.

Accordingly, I recommend that the existing D.O. standards be retained. Questions should be directed to me at 603-223-2541 or e-mail [vernon\\_lang@fws.gov](mailto:vernon_lang@fws.gov).

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